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Current Practice

FORENSIC MEDICINE AND TOXICOLOGY

Poisoning in the Home

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Accident and suicide are the two main epidemiological categories of poisoning; at home and at work are the two main places for it to occur; and clinically it may conveniently be classed as acute or chronic. Availability plays an important part in the incidence of poisoning and in the choice of agent by a person intending suicide, in the substance swallowed by a child, and in the toxic agent affecting a man at work.

Agents and Incidence

Modern engineering practice and the application of stringent regulations have greatly reduced the incidence of acute and particularly of lethal poisoning in industry, but chronic poisoning is more likely to be encountered there than in the home. Poisoning accounts for only 8.5% of all fatal accidents in males and for 13.5% in females, and this includes the whole incidence of fatal poisoning in children. Of the number of cases of poisoning admitted to hospital, however, those due to accident account for 39% of the whole, and this is largely because of cases of mild poisoning in children, which occur mainly at home.

The relationship of age to accidental poisoning shows a marked tendency for toddlers to be affected. In a series of such cases in Cardiff 61% were toddlers. Boys are more frequently involved than girls. Poisoning figures prominently in suicide. Of all cases of poisoning admitted to hospital in Cardiff from 1950 to 1963 61% were suicidal.

So far as can be seen from Cardiff hospital admissions (1950-63) some 50% of episodes of poisoning are due to prescribed medicines, 27% due to bought proprietary medicines, and 23% due to household substances, including coal gas. Of the adult cases of attempted suicide admitted to hospital barbiturates are involved in 49%, aspirin in 16%, carbon monoxide in 18%, and other substances in 17%. In all admissions for accidental poisoning (adults or children) barbiturates account for 17%, salicylate for 20%, gas for only 3%, and other substances for 37%. Alcohol is involved in about 23% of adult cases of accidental poisoning.

There are three classes of causative agent most commonly associated with poisoning in the home.

(1) *Soporifics*. These include (a) barbiturates (by far the commonest); (b) glutethimide (important because it can cause dangerous coma); (c) tranquillizers such as the phenothiazines; (d) minor tranquillizers like chlordiazepoxide; and (e), in a few cases, opiates. Alcohol is always a severe complicating factor.

(2) *Minor Analgesics*. Aspirin is the most important, but any drug of this type—phenacetin, compound codeine tablets, paracetamol, and rarely (in children) methyl salicylate—may be featured.

(3) *Carbon Monoxide*. This is usually an agent of suicide, but is also the cause of accidents from leakage or as a result of incomplete combustion. Children are susceptible to coal-gas poisoning, and old people are peculiarly at risk because of their inefficiency in handling apparatus and of their loss of sensory function, which makes them less aware of an escape of gas than younger persons.

Differential Diagnosis

Many cases of acute poisoning do not present features which enable the physician to diagnose the agent responsible, but obviously the more severe the case the more changes seen. In only 28% of men and 19% of women in the Cardiff series of cases of attempted suicide was the attempt totally unexpected. Of the remainder some had been under psychiatric care and the others were known to be severely depressed. It is here that information from the patient's doctor from his personal knowledge of the patient is so helpful. Owing to the increased mobility of people this information is not always available, and with the trend towards group practice the patient's doctor does not always know what drugs have recently been prescribed.

A clinical history should be sent to the hospital with the patient, but it may be unobtainable or may be distorted by mental disturbance. In the absence of a history physical examination becomes the sole source of information on which to base decisions on immediate treatment, since there is not time at this stage to obtain the benefit of ancillary diagnostic aids. The examination should include a search for evidence that poison has been taken. Such evidence should be transferred with the patient to hospital, but it must be remembered that not every patient found unconscious with a half-empty bottle by the bedside has been poisoned.

In the differential diagnosis of the unconscious state organic disease and trauma as well as poisoning must be considered, and the blood sugar, urea, electrolyte, and bicarbonate levels should be determined and an E.C.G. taken as soon after hospitalization as possible. A summary of the patient's medical history from his general practitioner can be most valuable in the process of deduction.

External Signs

A number of corrosive poisons produce obvious signs of external injury—for example, lime burns of the conjunctiva and acid or alkali burns of the skin. These may need heroic first-aid treatment. There are a number of irritants which produce less acute inflammatory changes in the skin after contact (e.g., abrasives which produce contact dermatitis at the wrists, shins, or collar area) and many drugs which induce dermatoses in sensitized individuals—e.g., the fixed eruption which may

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follow each ingestion of a particular drug such as a purgative, or the various sensitization dermatoses, such as those caused by aspirin. These are usually seen in adults.

Skin lesions due to the poisonous actions of drugs are difficult to differentiate from those due to other causes, but dermatoses may be of great help in directing attention to the possibility of chronic poisoning. Discoloration of the skin may be localized, as in lysol burns near the mouth, or be generalized, as with the pink staining in coal-gas poisoning, cyanosis, or methaemoglobinemia. Sweating occurs commonly in aspirin poisoning. Erythema or blistering may be apparent in coma whatever its cause, but it occurs particularly in coal-gas poisoning in parts that have been lain upon, whereas in barbiturate poisoning it may be seen more commonly on the hands and arms.

Nervous System

Many poisons exert their most serious effects on the nervous system, but all poisons affect it directly or indirectly. In conscious patients evidence of hysteria, neurosis, or psychosis must be sought for as suggestive of the possibility of poisoning. Dizziness, diplopia, slurred speech, and ataxia are classical signs of intoxication with a depressant such as alcohol, barbiturate, or a tranquillizer.

In unconscious patients the state of the reflexes is a guide to the depth of the unconsciousness. Sudden complete loss of consciousness may be due to poisoning, but such things as cerebrovascular accidents or myocardial infarction have to be excluded. In conscious patients complaints of tinnitus, of the light being glaring, and of headache may be due, among many other causes, to too much aspirin or to an attempted abortion with quinine. Depressant drugs affect the reflexes, but it is astonishing in how few patients (4% in 2,848 Cardiff cases) the reflexes are entirely absent after these drugs have been taken. When there is any doubt about the presence of an active laryngeal reflex the patient should not travel in an ambulance unaccompanied and a curved airway should be inserted.

Nystagmus or altered eye reflexes are of little value in assessing the depth of depression. Hyperpnoea in aspirin poisoning means that the drug has been absorbed in toxic amounts. It is a serious sign, since there is always a danger of sudden cessation of respiration. Patients in this condition should not travel unaccompanied.

Behavioural disorder from mild intoxication may be difficult to differentiate from that due to mental disorder, especially in the elderly. Lack of oxygen (carbon-monoxide poisoning, overdose of barbiturate) is a common cause. Insomnia, excitement, and tremor are a sign of stimulation. The amphetamine group are notorious for this effect. A strange restlessness with minor fits punctuating stupor occurs with many drugs—methaqualone, iron salts, antihistamines—and is especially often seen in children. Hallucinations and delusional states occur with many subacute poisonings—e.g., atropine and alcoholism.

Precise patterns of neurological disorder are not indicative of poisoning, but generalized signs may be. Examples are tremor or peripheral neuritis in chronic metal poisoning, and dyskinesia and bizarre gait in an overdose of phenothiazine. It must be remembered that the subjects of chronic neurological disorder may attempt suicide. Circumscribed sensory loss is unusual in acute poisoning but may accompany peripheral neuritis in a chronic poisoning.

Respiratory System

Cough and breathlessness are an indication of tracheal irritation, and, when combined with conjunctivitis, may be the main feature of exposure to an irritant fume. Abnormalities in the rate and depth of respiration are not very common (75%

of 2,716 poisoned patients admitted to hospital were normal in this respect) but may indicate the effect of a poison—for example, the hyperpnoea of salicylate poisoning, the stertor in coma, whether due to carbon monoxide or barbiturate, or the presence of a pulmonary complication in poisoning (4.4% of 2,915 patients). Physical signs in the chest usually accompany a change in breathing.

Fever is seldom a sign of poisoning, but a febrile illness may complicate it. Breathlessness, spitting blood, and loss of weight are not always due to a pulmonary infection or neoplasm: they may be caused by metal-fume fever. Rhonchi due to fluid accumulation in the lungs may be heard in a patient who has been unconscious for a few hours. Soft rales, fever, and tachypnoea suggest bronchopneumonia and warrant the giving of antibiotics. Obstruction to breathing must of course be relieved as soon as it is recognized.

Cardiovascular System

Acute peripheral circulatory failure may occur in severe poisoning. A number of drugs in poisonous doses have obvious effects on the cardiovascular system. Bradycardia and arrhythmia occur with an accumulation of digitalis; hypertension and tachycardia occur after amphetamine-type stimulants; and hypotension after phenothiazines, tranquillizers, and reserpine. Nevertheless, grossly abnormal findings are uncommon. They are treated symptomatically.

Alimentary System

Diarrhoea and vomiting are classical symptoms of poisoning, but are most commonly due to "food poisoning," and can be due to a multitude of causes unconnected with poisoning. Plant poisoning is no longer common. When it occurs, as from the attractive but bitter autumn fruits of the cuckoo pint (*Arum maculatum*), it usually results in purgation. The practice of passing a tube down the oesophagus and copiously washing out the stomach has been, or should be, abandoned. Suction may be applied with care in suitable cases after admission to hospital. It is helpful to examine the mouth for residues—e.g., aspirin powder.

The smell of stale alcohol or of acetone in the breath is helpful in differential diagnosis. Stomatitis and salivation may be a sign of heavy-metal poisoning (e.g., mercurials), and corrosives such as lysol coat the mucosa with a white or discoloured film. Foaming in the mouth in unconscious patients may indicate hyperpnoea (aspirin poisoning) or pulmonary oedema. Champing of the jaws may be due to poisoning with convulsants or epilepsy. Vomit is an obvious sign of gastric irritation, and it may be blood-streaked or a frank haematemesis. The cause varies, but aspirin poisoning in adults and poisoning by iron salts in children come to mind.

Urogenital System

Retention of urine is a common feature in unconscious patients and it must be relieved if it persists. Incontinence indicates a profound depression. With the exception of mercury, it is rare for poisoning to give rise to serious renal damage, pain in the loins, or haematuria, but the urine should always be examined for abnormal constituents. Sugar and albumin are often present after carbon-monoxide poisoning, aspirin gives a positive ferric chloride test, a barbiturate can be detected by special test, and porphyrinuria occurs in chronic lead poisoning. A fluid-balance chart is essential in case management. Forced diuresis is a too popular way of hastening elimination of poisons from the body. It should not be tried at home.

Liver

There are no particular signs which distinguish liver damage due to exogenous poisoning from that due to other causes, except the rapidity of the hepatic failure due to phosphorus, T.N.T., or tetrachloroethane poisoning or a clear association with drug-taking over a long period of time—for instance, jaundice during chlorpromazine therapy. Industrial poisoning and iatrogenic disease are more probable as causes of liver damage than deliberate poisoning.

Haemopoietic System

Anaemia, leucopenia, or thrombocytopenia—which may respectively be due to benzene or lead, chloramphenicol, and apronal—are defects of the blood which give rise to detectable syndromes, and it is necessary and difficult to exclude sensitivity to a chemical substance as the cause. Nor are these conditions easily treated. More obvious are colour changes. Pink cyanosis (cyano- and carboxy-haemoglobin) or blue cyanosis (methaemoglobinaemia in aniline poisoning) may be helpful in alerting the physician, but grey pallor is often all that is noticeable.

Common Domestic Poisons

Young children are peculiarly liable to poisoning, because they are actively exploring their home environment and have no knowledge of its dangers. Of the inquiries made about the nature of poisonous substances to the Poisons Information Centre in Cardiff between 1 September 1964 and 31 August 1965 68% concerned children and 43% of the total concerned household materials.

Analysis of the poisons concerned in cases of poisoning in children admitted to hospital in the Cardiff series shows that the cleanser and disinfectant classes of agent are the most frequent. Except for those containing lysol or lye, these substances are relatively harmless. A little vomiting, some coughing, a glass of milk as a demulcent, and the episode is over. Dettol and water has been mistaken for milk, and can have a severe effect on a baby but hardly any on a child. Paraffin oil and turpentine, which are next in order of frequency, are much more serious. Paraffin oil always causes pneumonitis. The child should be sent to hospital; gastric suction-lavage should not be attempted. Prophylactic antibiotics are called for. Turpentine is a poison which may severely affect the liver and kidneys.

Most degreasing fluids are less toxic than turpentine but cause "drunkenness." Salicylate poisoning is three times as common as barbiturate poisoning in infants, and both should be held to be potentially serious. The breaking of a clinical thermometer in a child's mouth is more likely to cause damage from the glass than from the mercury, which may safely be ignored. Other minor domestic poisons include metal polishes which contain abrasive, spirit, fatty acid, and ammonia. They are violently irritant and perhaps a little corrosive but not

lethal. Carpet cleaners are strongly alkaline, as is ammonia solution, and if ingested cause corrosion with severe sequelae.

Most of the deodorants are in aerosol cans and not easily ingested, but the spray is an irritant to eye and lungs. Lavatory cleansers are usually an acid sulphate, and when mixed with hypochlorite release fumes of chlorine. The majority of liquid cosmetics are harmless but contain alcohol. Some of the topical applications (lipstick, nail varnish, deodorants, depilatories) may cause dermato-sensitization or local irritation. Hair-dyes may be metallic salts ("colour restorer") or an aniline dye. Both are toxic if ingested by children. The metallic salts are more toxic, but the aniline dye is possibly more alarming owing to the intense methaemoglobinaemia it causes. Marking ink has the same effect.

Antifreeze usually contains ethylene glycol. At first it has only the effect of an alcoholic intoxicant, but the poisoning more closely resembles that due to methyl than ethyl alcohol, and may prove fatal from delayed hepatic and renal failure. Attempts at early emesis are of value, as indeed they are in all cases of poisoning.

Instructing a parent to induce vomiting in a child suspected of poisoning takes priority over organizing admission to hospital.

Prevention of Poisoning

Preventing poisoning in the home is an important aspect of preventive medicine, but it calls for a many-sided approach. Education of the public in the need for proper maintenance of domestic appliances is a part of the wider field of accident prevention, and in part is assumed by the manufacturers and suppliers. Perhaps the most radical step in prevention has been the progressive reduction in the content of carbon monoxide in coal gas.

Manufacturers of domestic products strive to introduce less toxic but equally salable materials, and they have been co-operative in disclosing the contents of their products to the National Poisons Information Service, which any doctor may consult.¹

Possibly the most useful contributions that general practitioners can make to prevention are: (1) to warn patients, and in particular the mothers of young children, of the potential danger of drugs prescribed; (2) to prescribe smaller quantities of drugs and less toxic alternatives, in particular for depressed patients; (3) to make more extensive inquiries about the existence of a state of depression, and take it seriously when it exists; (4) to insist on drug containers being labelled with the contents so that confusion may be reduced; and (5) to warn patients of the dangers of mixing drugs.

Perhaps it is time that the national media of communication and propaganda gave more attention to the preventive aspects of poisoning in the home, and a centrally organized campaign of this nature might be rewarding.

¹ The four centres in Britain are at Guy's Hospital, London (HOP 7600); the Royal Victoria Hospital, Belfast (Belfast 30503); the Royal Infirmary, Cardiff (Cardiff 33101); and the Royal Infirmary, Edinburgh (Fountainbridge 2477).